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Wm. Peter Hort of Georgia

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W. E. H.
Dean

Remarks
on
Diabetes Mellitus.

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Neceſsity is the mother of invention.

The progreſs of medical knowledge has of late years been rapid and brilliant, yet even at the present enlightened period there are many important principles undetermined, many interesting facts disputed, and several diseases whose pathology is involved in considerable obscurity; Impelled by the ardent thirst of knowledge, or excited by an honourable ambition, the members of the

medical profession have explored with indefatigable industry and minute attention the darkest paths of Science, have prosecuted their researches into the deepest recesses of nature, and proceeding upon the sure basis of experience & demonstration, have reaped for the most part the ample reward of their laborious & patient investigation.

The obscurity which the metaphysical & speculative reasoning of Aristotle diffused for centuries over the various branches of natural philosophy, has been dispelled by the clear rays of knowledge emanating from the more just and simple principles instituted by Bacon & Newton; but great as have been the discoveries & improvements in Science, since facts have been instituted in lieu of theories as the foundation of doctrines & systems, there remains much to be effected, much to be unfolded; the wonders and treasures of nature are inexhaustible,

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and in many regions of her widely extended Kingdom, there appear to be bounds beyond which no exertions of human power and intellect have hitherto enabled the philosopher to pafs.

In the department of medecine we find this to be the case, and physicians must acknowledge with regret that upon the long and dark catalogue of human woes, there are many diseases of whose pathology they are ignorant, and some that baffle their utmost skill and perseverance. Amongst these is Deabetes, which at a very early period excited the attention of medical men; it was for a long time deemed incurable, and at the present day much diversity of opinion and various speculations exist respecting its causes & treatments. Many important facts however have been established calculated to throw light upon its pathology. & although the obscurity which once enveloped it is not entirely removed, enough has been done to enable practitioners to institute

a successful plan of treatment.
We propose to direct our attention upon the present occasion, to the consideration of the most interesting facts and theories that have been advanced upon this subject and shall endeavour to arrive at some correct conclusions, fully aware however of our inability to do any thing like ample justice to the task we have undertaken.

The term Diabetes is derived from δια, through, and βαινω, to pass; many other names have been used by the old writers, as Dipsacus, Morbus Sitibundus, Fluxus Urinæ, Cachexia Urinaria, Diarrhœa ad Urinas, Diarrhœa ad Matulam, Hydrops Matulæ &c.

Two species of Diabetes have been spoken of by authors; the Mellitus, and the Insipidus. The latter as an idiopathic disease is of very rare occurrence according to Cullen, Ferriar & others, and comparatively of little importance;

It is to the Diabetes Mellitus that the following observations will be confined.—

(Diabetes Mellitus has been variously defined, by some, as an exceſsive discharge of crude urine exceeding in quantity the fluid drank. Boerhave says it is a frequent copious discharge of lacteous urine, in conjunction with an extraordinary tenuity of the fluids. Dr Cullen calls it a chronic flow of urine, made in immoderate quantities & of a preternatural quality. Dr Home defines it, an extraordinary increase of urine, with a sweetish taste, attended with a perpetual thirst, & a dry skin, which is for the most part scaly.— Dr Good speaks of it as a morbid secretion or discharge of urine. In Hosack's nosology, it is described as an immoderate excretion from the kidneys, consisting of urine, usually combined with a large proportion of saccharine matter, attended with Dyspepsia, great thirst, parched skin, emaciation & sometimes fever. It may be observed that to constitute this

disease, it is not necessary that there should be an immoderate discharge from the urinary organs, though this must doubtless be almost invariably an effect; it is the formation of Saccharine matter in the system which is the peculiar feature of Diabetes Mellitus.-

In the Nosological arrangement of this disorder, we find that most writers accord.- Sauvages, Linnæus, Sagar, Crichton, Parr, Swediaur & Hosack place it among the Fluxes.- Good, Pinel & Young consider it to be a secretory disease.- Darwin attributed it to a retrograde motion of the Absorbents & classed it among the diseases of the Absorbent system.- Dr Cullen has placed it in the Class Neuroses- order Spasmi.- Believing that the flux is merely an effect of the disease, to us it appears most correct to view Diabetes as an affection of the Secretory System.-

Before we proceed to consider the causes of Diabetes, it may be well to notice the

opinions of the Antients upon our subject.-

Hippocrates does not appear to have been acquainted with this form of disease, but it has been noticed by Theophilus, Actuarius, Aretæus, Aetius, Galen, Paulus Egineta, Avicenna &c. - Aretæus has given a long and clear account of Diabetes; he pointed out the profuse discharge of Urine, the emaciation and debility, the exceſsive thirst, & observed that the drink of the patient did not equal the urine in quantity; but he was ignorant of the change in the quality of the fluid paſsing through the kidneys & bladder, & supposed it to be merely the drink taken in, and discharged unchanged.-

Galen states that he saw two cases of Diabetes, he also describes the constant thirst and liquid discharges, unchanged though in their quality, and compares the disease to Dienteria.

Mercatus & Sennertus have given an accurate account of this disease, excepting the peculiar quality of the diabetic fluid.

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Of the causes of Diabetes

We see then that the Antients were aware of the existence of this disease, but of its pathology and proper mode of treatment, they were quite ignorant, and we are not surprised at this, since the most remarkable feature of this affection, the formation of saccharine matter, was unknown to them, & indeed it was overlooked by moderns as well as antients, until the time of Willis. That eminent physician first pointed out this interesting fact, & maintained that the honey like flavour of the urine, arose from a change which the drink had undergone. - Long before the time of Willis however the urine had been tasted, and the sweet taste observed, but it was ascribed to the medicines that were used. - Trincavella describes a case, in which a Julepum Rosaceum affected the urine with its colour smell & taste. - Hercules Saxonia in a similar case that fell under his observation, attributed the

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the sweet smell, colour & taste to the sweetened Ptisan which his patient had taken. It has been remarked that the saccharine beverage & diet of the Eastern nations, and the practice of the French & Italian Physicians who in most diseases prescribe ptisans sweetened with honey, will perhaps account for the early writers having omitted to notice the true characteristic of Diabetes.

Of the remote causes.

It was observed by Sydenham that Diabetes followed Intermittents, especially if much V.S. had been employed, and that acrid purgatives gave rise to it, & hence he drew the conclusion that it was a disease of debility. Dr Cullen seems to be at a loſs respecting the remote causes of Diabetes, he says that in most of the cases which occurred in his practice, he was unable to aſsign any particular cause; he admits that it often attacks men who have been intemperate in the use of spirituous liquors at some previous period; that it happens to persons of a broken constitution or who are in a cachectic state;

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that it sometimes follows Intermittents, & that it has occurred from the exceſsive use of mineral waters; but he adds that none of these causes apply very generally to the cases that occur, that such causes are not always nor even frequently followed by Diabetes, & that there are many instances of of Diabetes that cannot be referred to any of them. Dr Rollo states that in several cases which he collected, there was an hereditary disposition to the disease, members of the same family being attacked through ſucceſsive generations. Cold bathing, and exposure to cold & moisture under various circumstances are also said to excite this disease. It is remarked by Dr Parr that youth is rarely ever attacked with Diabetes, that its most frequent subjects are those who have drank liberally of wine in their earlier years, & who are also employed in the more violent kinds of busineſs.

Dr Ferriar confeſses that he is unable to aſsign any particular remote cause for the occurrence of Diabetes; he states that most of his patients were indu

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industrious men, not addicted to any kind of exceſs, some of them living moderately well, others faring very scantily; he thinks it very poſsible that the greater use of vegetables amongst the industrious poor, & the diminished consumption of animal food, occasioned by hard times, may have contributed to render this disease more common; yet in the neighbouring agricultural districts where animal food is seldom tasted by many of the labouring claſs this disease is hardly known, & generally occurs amongst persons employed in manufactories. (Med: Hist:)

Dr Thomas conceives that persons of a shattered constitution, & those who are in the decline of life, are most liable to be attacked; the few cases that occurred in his practice, all arose in persons who had indulged themselves freely in the use of ardent spirits, & who at the same time fared hard & were much exposed to cold; he also attributes the disease to the use of strong diuretics, exceſsive venery, severe evacuations, the immoderate use of acid drinks, or anything tending to produce an impoverished state of the blood & general

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debility. Dr Hosack is of opinion that any circumstances that will produce debility of the digestive organs, may be considered, as causes predisposing to Diabetes.

Of the proximate cause.

Upon this point a considerable difference of opinion still exists, & numerous are the theories that have been advanced; the greater part of them we shall hastily paſs over, dwelling only upon such as are most ingenious & plausible.

Sennertus suspected some communication between the liver & emulgent veſsells.

Barthollin referred the proximate cause to the lacteals, at that time newly discovered.

Dr Willis imputed this disease to a diſsolved state of the blood, which opinion seems to have prevailed until the time of Cullen, who suggested that the proximate cause of Diabetes, might be some fault in the aſsimulating functions, but observes that it is a theory embaraſsed with difficulties, which he could not very well remove.

Dr. Dobson supported Cullen's opinion & published a theory, in which he supposes Diabetes to depend upon the formation of saccharine matter in the stomach in place of chyle.

Dr Bardsley suspected the Lungs & says that he never met with an instance of Diabetes in which they were not affected; diſsection however has frequently exhibited the lungs in a perfectly sound state.

Dr Mead considered that the Liver was in fault, he fancied that he could perceive some resemblance between Diabetes & Jaundice, & affirms that steatomatous tumours were always found in the Liver; he attributes the sweetneſs to the bile, since, as he observes, "the water of bile separated from its salt is sweet." His opinion is very hypothetical, also controverted by diſsection, which proves that the Liver is rarely affected; & according to Thenard, Brande & other eminent chemists, the bile does not contain a particle of saccharine matter.

Dr Darwin conjectured that a retrograde motion

of the Lymphatics might be the immediate cause, & this opinion was at first well received; it has however long since been universally rejected. Profeſsor Richter of Gottingen, supposes that Diabetes is of a spasmodic nature, occasioned by a stimulus acting upon the kidneys, but as he does not attempt to account for the production of saccharine matter, & as a spasm of the kidney would rather tend to diminish than increase a discharge, we must reject the opinion as quite unsatisfactory; he evidently confounds the two Species of Diabetes.

By Dr. Thomas the proximate cause is referred to a perverted or diseased action of the kidneys, & he thinks that by this means the saccharine matter is produced in the urine, an opinion to which we can by no means aſsent, appearances after death being often decidedly opposed to this idea, compelling us to look elsewhere for a more satisfactory solution of the question.—

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Dr. Home attributed the disease to a defect in the aſsimilating proceſs, & is supported by Dr Rollo who devoted no small degree of attention to this subject, & whose observations well merit our serious consideration; he maintains that the immediate cause of Diabetes Mellitus, is a morbid condition of the stomach, with an increased secretion & alteration in the quality of the gastric fluid, producing saccharine matter by a decomposition of the vegetable subtances taken in as food; that the kidneys & other parts of the system are affected secondarily & generally by sympathy, as well as by a peculiar stimulus.- In support of this theory he adduces the following arguments.

1. That an affection of the stomach always accompanies the disease, & is materially different from that which is sympathetic of primary affections of the kidneys.
2. That an affection of the stomach generally precedes the urinary characteristic symptoms of the disease.-

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3. That a diet of animal food with an entire abstinence from vegetables or other substances capable of forming sugar in the stomach, speedily removes the general symptoms, as the formation of saccharine matter, & the increased discharge by the urinary organs.

4 That diſsection has shown no morbid state of the kidneys, but what may be referred to a continuance of increased action, from the application of a simple stimulus, & probably sympathy, augmenting merely the capacity of their veſsells.

To this position which is certainly well supported, Dr Ferriar objects, & argues as follows, "After revolving in my mind the morbid appearances which I have witneſsed, I could not find reason to believe that the saccharine matter originated in the stomach; I have at this time under my care two diabetic patients whose complexions are ruddy & distinct, & who, though considerably reduced in size, have too

healthy an appearance to admit of Dr. Rollo's supposition of depraved action in the stomach, yet those persons have been ascertained by experiment to paſs a very considerable proportion of saccharine matter with their urine; but in order to overthrow this doctrine of Dr. Rollo's, it is sufficient to observe that saccharine matter has never been detected in the stomach and bowells. I have seen nearly a complete suspension of aſsimilation in the stomach & bowells, without any diabetic symptoms whatever. The contents of the stomach & bowells appear as far as they can be examined to be in a natural state, whilst a morbid secretion is paſsing through the kidneys & bladder." (Med: Hist:)

Dr. Ferriar farther observes, that whatever alterations may have been fancied or observed in the blood drawn from diabetic patients, they bear no kind of proportion to the quantity of morbid secretion, paſsing off by the kidneys. Dr. Henry also urges objections against Dr.

Rollo's theory. 1. That is has been proved most satisfactorily by Nicolas & Gaudeville, Dr. Wollaston & his own experiments, that sacch: matter does not exist ready formed in the serum of diabetic blood, & secondly, that it cannot be shown that there is a direct communication between the digestive organs & the kidneys or bladder, capable of conveying sugar from the former to the latter, without its passing through the general circulation. (Med: Chir: Trans: Vol. II.).

In the 1 vol: of the American Med: & phil: register, an interesting case is detailed by Dr Mott, in which he states that the bowells & stomach were unaffected from first to last of the disease, and other cases of the same nature have occurred, amply sufficient to overthrow Dr Rollo's second position, "That an affection of the stomach always exists in this disease", at the same time however it must be admitted that these cases are exceptions to

a general rule.

Dr. Ferriar at one period believed that Diabetes was a local disease seated in the kidneys, but further experience, & consideration of the subject, induced him to draw a different conclusion.– He says that the internal & external ulcerations of the kidneys of patients who have did of the disease, may be referred with propriety to the extreme irritation which they undergo in transmitting such unusual quantities of a foreign body, & that it has not been observed that the ulcerations of the kidneys which take place in aged persons, have produced Diabetes.– He agrees with Dr Cullen that the supply of nourishment for the solid parts is interrupted, but denies that the defect of aſsimilation is in the primæ viæ; he conceives that the extreme veſsells take on a morbid action, & instead of supplying the waste of the system by nutritious particles, secrete the sacch: matter, which having acquired a tendency towar

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towards Chrystallization, cannot be applied to the purposes of nutrition, its presence in the extreme veſsells destined to that office, operates as a stimulus from a foreign body & he concludes that it is then hurried through the anastamosing branches to the kidneys, exciting by its quality an increased action in the whole system of veſsells connected with those organs; he conceives that the increased action of the exhalents in Diabetes is a further proof that the seat of morbid action lies in the extreme veſsells, & illustrates his opinions by the similarity of proceſs which takes place in continued fevers, & other morbid affections.–

" In continued fevers, he remarks, we perceive the tongue covered with a crust, which frequently resembles that which occurs in Diabetes; we see the emaciation of the body proceed in a similar manner & we notice the formation of morbid substances in the urine occasioning the sediment. If those substances are formed by the extreme veſsells, the connection between their appearance in the

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urine, and the intervals of the febrile paroxysms admits of a ready explanation. In Typhus where the disease sometimes extends to the length of two or three months, the morbid urinary sediment becomes a continued proceſs, like the formation of saccharine matter in Diabetes. It is no uncommon occurrence in diseases to find large quantities of natural or morbid secretions paſsing through the kidneys or deposited in different cavities of the body; besides the familiar instance of bile carried off in its proper form by the urinary paſsages in Jaundice, or deposited under the skin, we know that urine in Ischuria is carried from the kidneys & bladder, & deposited under the membranes of the brain; & that pus & even the calcareous matter of the bones are in like manner removed from one part of the body to another, without preventing the organs through which they paſs, from exercising their proper functions, or at least without disturbing them in any remarkable degree. To this operation which is well known

by the name of Metastasis, I am inclined to refer the deposition of the diabetic fluid in the Kidneys. In what specific manner the proceſs of Metastasis is performed, we cannot in the present state of Knowledge explain; the difficulty is not greater in the case of Diabetes, than in some other diseases. But there is evidently in Diabetes, a defect in the supply of nutritious matter, for the repair of the parts absorbed, & in consequence, an increased action of the absorbent veſsells, which go on decomposing the solids, till the utmost degree of emaciation ensues, & until ulcerations in the tongue & gums, and sometimes even of the Kidneys themselves take place. (Med: Hist:)

This theory of Dr. Ferriar appears to be well supported by facts and by analogy, but as he readily admits, it is in the present state of medical knowledge, evidently incomplete. We can readily follow the Dr. until the sacch: matter has been secreted by the extreme veſsells, but we are at a loſs to comprehend how it is

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conveyed thence to the kidneys, & what are the anastamosing branches to which he alludes: if he refer to the sanguineous system, the very same argument that he urges against Dr Rollo, ("that whatever alteration may have been observed or fancied in the blood drawn from diabetic patients, it bears no kind of proportion to the quantity of morbid secretion paſsing off through the kidneys"), applies with equal force to his own position; but the evidence in favour of saccharine matter having been detected in diabetic blood is very trivial, for what is the conclusion which Drs Dobson & Rollo, the great advocates for this fact, drew from their experiments, —— simply that the serum of the blood often aſsumes the appearance of whey, & like it *seems* to contain sugar, or at least has lost its usual salt taste: (*Thom: Chemistry Vol IV.*) such testimony cannot with any shadow of propriety be opposed to the positive aſsertions of Henry, Nicolas,

Gaudeville. Ferriar & Wollaston who have so industriously & critically investigated the fluids in Diabetes. Again, if Dr. Ferriar adverts to the absorbent system, we shall find that the same difficulty still exists.- Arteries terminate in veins, in glands, in cells, in lymphatics & in exhalents, & in some one of these receptacles would the morbid secretion of saccharine matter be deposited; we have already seen that it cannot be in veins, we know that in the case of Diabetes, it is not thrown out upon the surface by the exhalents, it remains to be disposed of between the cells, glands, lymphatics, & such of the exhalents as terminate in cavities, joints &c.. from either or all of which it would be conveyed by the absorbents into the Thoracic duct or right subclavian vein, & ultimately through the general circulation before it could reach the kidneys. There remains then no alternative but to imagine the existence of a set of vessels that establish an

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immediate communication between the surface of the body & the kidneys, in support of which no more evidence can be adduced than for the existence of a similar communication between the primæ viæ & kidneys, & we know that the labours of Darwin, Wollaston, Brande, Marcet, Tiedmann, Gmelin & others to determine this point have been in vain, or to admit that the sacch: matter does paſs through the sanguineous system, applying the ingenious reasoning of Profeſsor Chapman upon the modus operandi of medicines. The latter supposition we shall attempt to uphold, aware however that it is exposed to some important objections that cannot easily be obviated. Dr C's views are too well known to render it neceſsary to enter into any detail respecting them, we may therefore proceed immediately to the application of the principle. The saccharine matter secreted by the extreme veſsells being a foreign substance, is excluded from entering

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into the absorbent system by those "vigilant centinels" which guard the extreme approaches of the body, it must first be reduced to a homogenous fluid by the assimilating power which Dr C concludes to be possessed by every part of the Absorbent Apparatus; it is then taken up, carried along the usual route to the kidneys & through the urinary organs, when being removed beyond the controul of the vital energies, chemical affinities are again brought into action, & the sacch: matter is regenerated. We observe that although the admission of this fact removes one of the objections to Dr Rollo's theory it leaves the other in full force, namely that sacch: matter has never been detected in the stomach or Intestines, & that cases have occurred in which the stomach was unaffected.—

The objections that may be urged, arise from the circumstance that the testimony & experiments of physiologists upon this subject are so much at variance: Thus

while many eminent men are of opinion that the Nervous system alone is acted upon by foreign or poisonous substances, that none but a homogeneous fluid can be taken up by the absorbents, & support their doctrine by ingenious reasoning & an appeal to facts, we find others who profess as strong claims upon our faith contending for directly opposite theories & facts. The experiments of Magendie & Segalas, of Drs. Lawrence & Coates, & of Sir Everard Home, besides other facts well authenticated certainly lead us to infer that the absorption of other than homogeneous substances may take place. Instead of endeavouring to reconcile evidence apparently so contradictory, which is daily brought forward by the advocates of systems, & speculating in the dark about things that are beyond our reach, we prefer admitting that more than one law governs the operations of substances upon the living system, that some are incapable of being absorbed, & act

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through the medium of the Nervous System; that some bodies are aſsimilated and then enter the general circulation; that others are taken up unchanged, and finally that another claſs acts by a local action upon the mucous membrane of the stomach. In Diabetes we believe that the sacch: matter is aſsimilated before it is absorbed, but we have observed that no traces of sugar can be detected in the blood of Diabetic patients, & we may now be called upon to explain how it happens that the component parts of the sacch: matter, which are paſsing through the sanguineous system, cannot be detected in the blood which has been drawn from a vein & removed beyond the controul of vital principles; —— why the component parts are not then recombined as in other cases.- An explanation we cannot give, but we can adduce an analogous fact in support of our supposition that a foreign substance may be absorbed, & yet

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not detected in the fluids either within or without the controul of the vital principle. It is recorded in the Edinb: Med: & Surg: Jour: for Apl. 1823 art: An experimental inquiry on Poisoning by Oxalic Acid. By Drs. Christison & Coindet. After proving distinctly that the acid is absorbed, they proceed to determine the nature of its action on the blood,

"With this view, therefore, in a dog who died 30 seconds after the injection of eight grains into the femoral vein, we examined very carefully the blood in the vena cava & right side of the heart. It did not redden litmus, & in the filtered serum the hydrochlorate of lime caused not the slightest precipitate. In many animals too that had been killed by the introduction of the poison into the stomach, intestines, pleura or peritoneum, these experiments were carefully repeated; & we never could detect the slightest trace of oxalic acid, even in the vessels nearest the seat of absorption. We have also examined

the chyle in the thoracic duct after the poison had been introduced into the intestines; we have even attempted to trace it in the bile, the urine, the frothy contents of the air cells of the lungs, & the moisture of the serous surfaces, but with no better succeſs.

After so many unequivocal proofs of its absorption, it was certainly a most unexpected circumstance that it should not be found in the blood; & it is not the leſs singular, when we consider how easily it is detected if added to blood just drawn from a vein. The test of hydrochlorate of lime, as every one knows is exceedingly delicate; & we have ascertained, that its delicacy is not impaired by the presence of such principles as are contained in the serum of the blood."

We next proceed to examine the Symptoms.

Diabetes is very insidious in its approach. Dr Cullen observes that it comes on slowly and almost imperceptibly without any previous disorder,

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that it often arises to a considerable degree and subsists long, without being accompanied with evident disorder in any particular part of the system; on other occasions, (& perhaps such are of the most frequent occurrence,) Bulimia & other dyspeptic symptoms appear & subsist for even twelve months previous to the acceſsion of Diabetes, as stated by Drs Rollo, Ferriar &c.; however when completely formed, the symptoms are well marked. The patient has a most voracious appetite, and exceſsive thirst; the tongue is foul, covered with a thick, dry, yellow crust & sometimes white with bright red edges, the mouth is parched, & there is a constant spitting of viscid phlegm of a mawkish or bitterish taste, the gums are often ulcerated, with other striking evidences of derangement in the chylopoiëtic viscera, as a sensation of internal heat & fluttering; the skin is hot, dry, parched & often scaly, the pulse ranges from 80 to 90 beats in a minute; an irritable febrile state exists; the bowells are usua

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Sometimes Diabetes Mellitus is suspended by the attack of another disease; Dr Gregory of Edinburgh mentions two instances, which occurred in his practice; in one all the diabetic symptoms were suspended during an attack of Pneumonia, & in the other by Tonsillitis, but sometimes other disorders will supervene without interrupting the course of the original disea

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disease; In the 1 Vol: of Amer: Med: & Phil: Register the case of a boy nine years old is recorded, who, when in a very emaciated state from the effects of Diabetes, was attacked by Tetanus & Pneumonia, & died from effusion of mucous into the lungs, the diabetic symptoms continuing throughout: The Stomach & bowells were unaffected during the whole time.

It has been remarked that diseases which invade a constitution under the influence of Diabetes, are commonly of an inflammatory type & often prove fatal.

We have already observed that the discharge of fluid by the urinary organs is not always in excess in this complaint. It will be found to vary very much; Dr Ferriar's patients passed upon an average from three to four quarts in the day, exceeding the quantity of fluid drunk by about One quart & a half, & he had one patient who passed twenty three pints in twenty four hours. One of Dr. Home's patients

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paſsed from twelve to fifteen pints in twenty four hours, when he drank from ten to twelve pints so that his urine exceeded his drink generally by two pints; another of his patients paſsed seven or eight pints more than his drink in the course of a day. Cardanus describes the case of a girl who discharged thirty six pts: each day, when her meat & drink amounted to only seven pounds, & Shenkius mentions an instance of a woman who in the space of a few days, paſsed more fluid than the weight of her body. The discharge then sometimes exceeds not only the fluids taken in during the day, but the whole ingesta, solid & liquid. It varies also at different hours of the same day, according to the quantity and quality of the food, the length of time after eating, & the state of the stomach at the time, with respect to activity, which in the more chronic state of the disease is variable, while in the acute it is more steady.

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It moreover appears that the debility & emaciation depend more upon the quantity of sacch: matter that is formed, than of the fluid discharged, exemplified by the following case extracted from Dr. Ferriar's Med: Hist: Vol IV.

"Josh. Fletcher was admitted July 1st. 1811; he was emaciated, had a foul tongue, and uneasy sensations in the testicles; his urine did not exceed five pints in quantity during twenty four hours, but it was by experiment found to contain a considerable portion of sacch: matter; he had been ill about ten months. He was ordered ʒi Cinchona, & ʒss. Uva Ursi with Opium gr ½, to be taken with lime water four times a day; he was directed to live upon animal food alone; on the 7th. his urine was reduced to four pints & a half, & on the 10th. to three & a half; during this period he was generally costive & required frequent doses of Castor oil: from the 11th. to the 13th. he passed only three pints of water in 24 hours,

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and the proportion of sacch: matter was still undiminished; from the 14th. to 25 July, he passed but two pints & a half in the day, & it was found to contain an equal quantity of Sacch: matter as before. — After some weeks, the disease yielded, his urine became brackish, & his health being restored, he was discharged cured.

In this very curious case we have an example of Diabetes Mellitus; in which the urine was scarcely greater in quantity than what is natural, even at its commencement, & long before its conclusion was reduced to the natural standard without a diminution of the relative quantity of saccharine matter, yet the general debility and emaciation were as remarkable as if he had been voiding urine in very large quantities."

(Dr Black evaporated the urine of two of Dr Home's patients, & found that in one case each pound yielded ℥ jss. of brown sacch. matter resembling sugar, & in the other each pound yielded ℥i, so that the first patient

paſsed ℥xx ss. of sacch: matter in twenty four hours, when he made fifteen pints of urine. Dr Rolls relates a case in which ℥XXIX were detected in twenty four hours: According to Cruikshank & Ferriar, the average proportion of sacch: matter is estimated at about 1/12 in every pint of fluid.

It has been disputed whether the sacch: matter existing in diabetic urine be identical with sugar. Mr Cruikshank in his experiments, extracted from urine about 1/12 of its weight of a sweet tasted extract like honey, which when treated with nitric acid, yielded the same proportion of Oxalic acid, as an equal quantity of common sugar would have done; making allowance for the saline substances present. No saclactic acid was formed; hence it follows that this substance is not analogous to the sugar of milk, but nearer common sugar in its properties. It cannot however be made to crystallize regularly like common sugar.

and Nicolas affirms that when treated with lime, it is decomposed; if so, it certainly differs eſsentially from common sugar, which was first proved by Cruikshank to be capable of uniting to lime without decomposition. Nicolas, Gaudeville & Thenard have obtained by the fermentation of diabetic extract, very nearly the same weight of Alcohol as would result from an equal weight of vegetable sugar. (Thom: Chem: & Med: Chir: Trans: Vol II.)

The following experiment was made by Dr Henry upon the urine of one of Dr. Ferriar's patients; Its specific gravity varied from 1029 to 1033, the first urine voided in the morning by a healthy person having usually the specific gravity of 1020; when evaporated by the heat of steam it yeilded about 1/15 of its weight of a tenacious extract, which became hard & brittle on cooling & consisted almost entirely of sacch: matter, without any of that peculiar substance (Urea), which distinguishes healthy urine;

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no urea at least could be discovered by the application of Nitric acid, which is the usual test employed, & which causes an immediate precipitation of bright pearly scales, resembling very closely in their ~~the~~ appearance the Boracic acid, when Urea is present. In decided cases of Diabetes Mellitus, Dr Henry has invariably found that the Nitric acid failed to give any indications of the presence of Urea; he, however suspects that the action of the acid upon the Urea might poſsibly be prevented by its agency upon the greater proportional maſs of Sugar; to determine this point, Nitric acid was added to artificial mixtures of the extract from diabetic urine & natural urine, & from his experiments he inferred that urea can no longer be detected by Nitric acid in the extract from any mixture of diabetic & natural urine, when the former exceeds the latter by a greater proportion than six to one or as nearly as he could estimate from other experiments, when solid urea is

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less than 1/20 of the weight of the mixed extract. Dr. Henry however at last succeeded in detecting urea in the aforesaid case by the following methods of analysis.

" There is one property of urea originally pointed out by Fourcroy & Vauquelin which enables us to detect it even when present in such minute quantities as to escape discovery by the Nitric acid. Amidst the great variety of animal products this appears to be the only one which is decomposed when in a state of solution by the temperature of boiling water: At this low degree of heat, its elements held together by a balance of affinities which is easily disturbed, arrange themselves in a new order: Ammonia & Carbonic acid are generated, & Carbonate of Ammonia is produced, equal in weight to about two thirds that of the Urea. It is in the fluid therefore condensed during the evaporation of Diabetic urine, that we are to look for traces of the existence of Urea, & in this fluid I have invariably

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found a sufficient quantity of Carbonate of Ammonia to restore the colour of reddened litmus paper, & to precipitate Muriate of lime. When the distillation is carried so far as to reduce the residuum to charcoal, the last products are strongly acid, in consequence of the production of the pyromucous acid from the decomposed sugar. Even in these latter products a proportion of Ammonia exists, & may be obtained in a separate form by first saturating the liquid with pure potash, & then submitting it to a second distillation. The condensed fluid will invariably be found to contain volatile alkali though often in very minute quantity. It is on the Ammonia which comes over early in the distillation of diabetic urine that I am disposed chiefly to insist, as establishing the presence of Urea, because we are unacquainted with any other animal substances, which can give origin to the Vol: Alk: under such circumstances. Another proof of the existence of some portion

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of Urea in diabetic urine, may in many instances be obtained by a careful observation of the phenomena attending its spontaneous decomposition. At a temperature exceeding 60° Fahrt., diabetic urine passes rapidly to the acetous state, but if the succession of changes be carefully watched, it will be found that there is a point, at which, before it becomes acid, it exhibits to sufficiently delicate tests, distinctly alkaline properties. In the cases where I have attempted to estimate the deficiency of Urea in Diabetes, the Urea has not appeared to exceed from $\frac{1}{40}$ to $\frac{1}{60}$ of the quantity contained in an equal measure of healthy urine." (Med: Chir: trans: Vol: II.)

(Dr Henry therefore concludes that Urea may be discovered in all diabetic urine, & this is an important fact since it proves that the secretory office of the kidneys, however it may be deranged, is not altogether destroyed even in the worst forms of the disease.

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The Blood when first drawn in this disease exhibits the buffy coat in most instances. In the V Vol: Med: trans:, several cases are detailed in which the lancet was employed: In every instance the first blood drawn had the appearance of a homogenous black maſs, poſseſsing no firmneſs, resembling treacle, & not separating by rest into serum & craſsamentum; after each bleeding it became firmer & more natural in appearance, & in the first case after the fourth V.S. the craſsamentum was covered with a membrane analagous to the buffy coat but of an intense scarlet colour. Dr Dobson & others have maintained, but as has been already seen upon very slender evidence, that saccharine matter exists in diabetic blood, but the statements disproving this fact are more than sufficient to satisfy my mind upon this point. Dr Ferriar examined with the greatest attention, a small quantity of blood taken from the arm of Brooks, a patient whose case was decidedly

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Diabetes Mellitus. It did not afford the smallest trace of sugar, on the most careful analysis.

Appearances post Mortem.

Diſsection, though it has disproved many theories, has not contributed much to elucidate the nature of Diabetes. The liver has been frequently found in a perfectly sound state, & it has often occurred that no morbid change could be detected in any organ of the body, a circumstance that affords the strongest poſsible support to Dr. Ferriar's theory of the proximate cause being seated in the extreme veſsells. The kidneys have been generally found enlarged, especially the tubulæ uriniferæ, & in a very flaccid state. In some instances, they have been found much more vascular than in a healthy state & containing in their infundibula a quantity of whitish fluid resembling pus, but without any signs of ulceration, at the same time the superficial veins on the surface were found to be much fuller

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of blood than usual, forming a most beautiful net work of veſsells. Cullen considers the diseased state of the kidneys as the effect, not the cause of the disease. Ferriar refers the flaccidity of these organs to the general debility of the system. Dr Rollo thinks that diſsection has shown no morbid condition of the kidneys, but what may be referred to the stimulus of the morbid fluid paſsing through them; but what has been already observed sets the matter beyond dispute, the kidneys, as well as every other organ in the body, have been found unaffected; it is not long since an instance of this fact occurred in the New York Hospital; the kidneys of the patient were perfectly natural. The whole of the Mesentery has been found much diseased, & its glands remarkably enlarged; many of the lacteals have likewise been seen considerably enlarged & diseased. In some cases the coats of the bladder are much thickened, & its size leſs than natural, containing some muddy urine.

Of the Treatment.

In the writings of the antients, nothing useful is to be found respecting the cure of Diabetes. This disease was for a long time deemed incurable, nor is it a matter of surprise that all the means employed for its cure should have failed, when we consider that Physicians overlooked the most important feature of the disease, & were quite ignorant of its pothology. It would be needleſs to ennumerate the various modes of treatment that have been tried & found unsuccessful. Of late years two modes of treating Diabetes have been instituted, & both have been attended with very happy results although quite opposed in their principles. The Tonic practice was first suggested & employed, the Depleting subsequently.—

The Tonic practice is founded upon the opinion that Diabetes is a disease of debility, which idea seems to have been suggested by Sydenham. Mercatus & Willis prescribed

the most nourishing kind of animal food, & mucilaginous substances for the patients diet, the latter added the use of lime water. Dr Rollo however is considered as entitled to all the honor of a discovery in his plan of animal diet which proved so fortunate. He conceived that by abstaining from all substances that yield sacch: matter, the morbid action upon which the formation of sacch: matter depends, might in the course of a short time be suspended, & a complete cure effected by strong animal diet & the use of alkalies, alone, or in the form of hydro-sulphuret of Ammonia. - Dr Ferriar cured ten cases out of thirteen by pursuing the tonic course; - he at first prescribed bark & sulphuric acid, but soon changed this plan for a combination of Cinchona & Uva Ursi āā ʒss. with Opium gr. ss. to be taken with lime water four times a day, confining them entirely to animal food & opening their bowells when costive by small

doses of Castor oil. Dr Hosack has met with similar success in several instances by pursuing the same plan of treatment.

A case of Diabetes Mellitus is recorded in the XIII vol. Med: Jour: by Mr Ernest, which was successfully treated by confining the patient to a diet of animal food, with a generous allowance of Porter, giving at the same time nitric acid in the proportion of ʒi or ʒij to Water Oij, with about ℥i Sugar daily. The practice of blood letting in this disease must have arisen from the belief that the proximate cause of Diabetes was an inflammy action in the kidneys. It was proposed & carried into effect by Dr Robt Watt who employed the lancet with success under the most unpromising circumstances, such as feeble low pulse, loss of strength & appetite low spirits & cold œdematous extremities. In one of the cases recorded V.S. was continued until one hundred & eighty ounces of blood had

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been taken away; the result was a perfect restoration to health. In the Edinb: Med: & Surg: Journal No XXIX, a case is related, in which V.S. frequently repeated cured an old man of seventy two, & in the v vol: Med: trans: of London College of Physicians, several cases are detailed, treated in the same manner with succeſs by Dr Saterley; in the first in particular, the symptoms were strongly marked, and so evident were the progreſsive beneficial effects of the succeſsive bleedings, that the patient was induced to desire a more frequent repetition of the remedy than was deemed prudent. Those gentlemen however who advocate the use of the lancet enjoin a strict adherence to an animal diet.

It is indeed difficult to reconcile the compatability of two methods of cure, so opposite in their nature, but to facts we must submit how repugnant soever they may prove to our speculations.

It is well known that in Fevers sometimes, when

the Intestinal Canal is overloaded & great prostration exists, Cathartics will impart vigour instead of increasing the debility of the patient, & may it not be argued by analogy that in Diabetes, V.S. by relieving the veſsells impacted with the component parts of the sacch: matter, enables them to recover their tone, at the same time that it removes in part, the foreign materials that irritate the Kidneys, thereby diminishing inflammatory action while abstinence from vegetable substances cuts off the supply of the morbid materials, & an animal diet & Tonics repair the waste of the system; but without further speculation, we deduce from the consideration of the foregoing facts & statements, the following conclusions.-

1. That Diabetes Mellitus is a disease of the whole system.

2 That the remote causes are any circumstances that produce debility of the aſsimilating functions.

3. That the proximate cause is a morbid condition of the aſsimilating functions, whereby saccharine matter is produced by the extreme veſsells in lieu of muscular fibre, nerve, bone &c.

4. That this saccharine matter is decomposed and carried off by the Absorbents, that it paſses through the general circulation and finds an exit from the system through the urinary paſsages, crowding and debilitating the veſsells in its course and often irritating the kidneys & other organs of the body.

5. That the most correct indications of cure are 1. To cut off the supply of saccharine matter by abstaining from all such substances as yield it, and substituting an animal diet.

2. By Tonics, to restore the functions of the body and repair the waste of the system.

3. To keep open the emunctuories of the body; the skin, by a flannel dreſs and occasional small doses of Dover's powders; the bowells, by

laxatives, as castor oil &c. - and
4. If the pulse indicate congestion, and the strength of the patient be not too much exhausted, to relieve the vessells by bleeding cautiously regulated according to the circumstances of the case.
